OPTICAL DEVICES FOR PARTICULATE MATTER CONTENT IN INTERNAL COMBUSTION ENGINES EXHAUST GAS DETERMINATION

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One of the transport problems are the emissions of particulate matter (PM) from the exhaust gases of the piston internal combustion engine of vehicles, both on urban and regional levels.

The main methods for determining the mass emissions of PM from diesel exhaust gas (EG) flow as well as some other parameters of aerosol "EG – PM" and proper PM according to used methods should be divided into the following [1, 2]: 1) Optical; 2) Weight; 3) Experimentally-calculated; 4) Settlement.

On use of optical methods relies on such devices [1, 2]:

1. Instruments for measuring optical density EG (Hartridge type opacimeters). They measure the absorption luminous flux coefficients K (m^{-1}, K = 0 ... ∞) and luminous flux weakening coefficients N_D (in %, N_D = 1 ... 100) of cooled EG sample column (layer) of light signal (luminous flux) with known parameters, which passed through the EG sample from the calibrated light source, by the photosensitive element that signal recorded by device. With this method, the EG sample selected or from diesel exhaust tract by probe tube (in partially flow devices) or directly from diesel exhaust system outlet cut (in full flow devices).

2. Devices of Laser Digital Holography. They are based on the use of perspective principle which provides EG sample column scanning with a laser beam that hits the high speed photosensitive pixel electronic matrix, if not reflected from the PM (dissipated). Information from the matrix processed by a computer, based on what is built hologram by interference method. In analyzing of this diagram are defined diameter, weight and volume of PM and distribution of these indicators their quantity.

3. Devices of exhaust filtration method (Bosch type opacimeters). Principle of their work based on by passage samples of VG of certain volume through a special Teflon or paper filter and further determine its degree of blackness by an optical method – or visually (compared to the benchmark), or through photometer (shows or register parameters or reflected from the filter surface light flow from calibrated source) or by special graphics software to work with images that are scanned of stabilized filters.

References

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2. Robert Bosch GmbH (2002), “BOSCH. Avtomobil’nyj spravochnik: perevod s anglijskogo” [BOSCH. Automotive handbook: transl. from English], Moscow, Publ. ZAO KZhI “Za rulem”, 896 p. Print. In Russian.